PNW 497

Short-Season Vegetable Gardening

Jo Ann Robbins and Wm. Michael Colt

Introduction

Pacific Northwest gardeners may find the growing season where they live too short to grow certain vegetables. Air and soil temperatures may be lower than optimal for plant growth. Untimely frosts or snow, combined with low humidity and excessive wind, make it necessary for the home gardener to use special practices to get the best production. The techniques outlined in this publication will be essential to grow most vegetable crops.

To successfully grow vegetables in short season areas, you will need to become a weather watcher. Information is available on weather radios, cable TV stations, and local newspapers. These should be monitored to anticipate adverse weather conditions such as local frosts. Equip your garden with an accurate high and low temperature recording thermometer to chart daily extremes. Obtain a number of high quality, dial type soil thermometers. Place the thermometer probes in your garden soil at rooting depth. The temperature of your soil will indicate what seeds and plants can be planted, and how much heat is available under plastic mulches and plant covers.

In order to get started in vegetable production, determine the length of your frost-free growing season. It can be as short as 21 days. Remember, the growing season may be 20 percent shorter or longer than average, and some years are better than others. Don't let conventional local wisdom discourage your gardening adventures but realize that local experience is useful in defining what's possible. (See EXP 494, "Spring and Fall Freezing Temperatures and Growing Seasons in Idaho" and CIS 844, "Frost Protection for the Home Gardener.")

Choose the warmest spot possible for your garden.

Choosing the best garden site is critical for success in vegetable gardening in areas with short seasons and cool climates. Even a small change in temperature can make a difference during spring and fall frosts. Garden site selection affects wind exposure, temperature, and humidity. Wind removes heat radiating from the soil, dries out plants, and causes plants to close their stomates (tiny leaf openings) to conserve water, thus reducing growth potential. Humidity can raise the temperature slightly by acting as a heat sink around plants.

The garden site should be in an area that receives full sun and provides protection from the wind windbreaks such as vegetation or buildings. The south-facing side of a building or wall is ideal, as the site will receive reflected light and heat. A gentle south or southeast slope with good air drainage will warm early in the spring and will not be a frost pocket. Avoid low-lying areas where cold air accumulates. Orient plant rows north to south to maximize sun interception over the entire leaf canopy. Light, sandy loam soil warms faster than heavy clay soils. (See CIS 755, "Planning and Preparing the Vegetable Garden Site," and EC 871, "Planning a Home or Farm Vegetable Garden.")

Prepare the soil carefully.

Short season gardeners must have the best soil possible in order to develop crops quickly. Wet, clay soil stays cold late into the spring. A light, sandy loam is ideal. Amending soil becomes important if it has too much clay or sand, or if it is compacted. Adding organic matter will loosen

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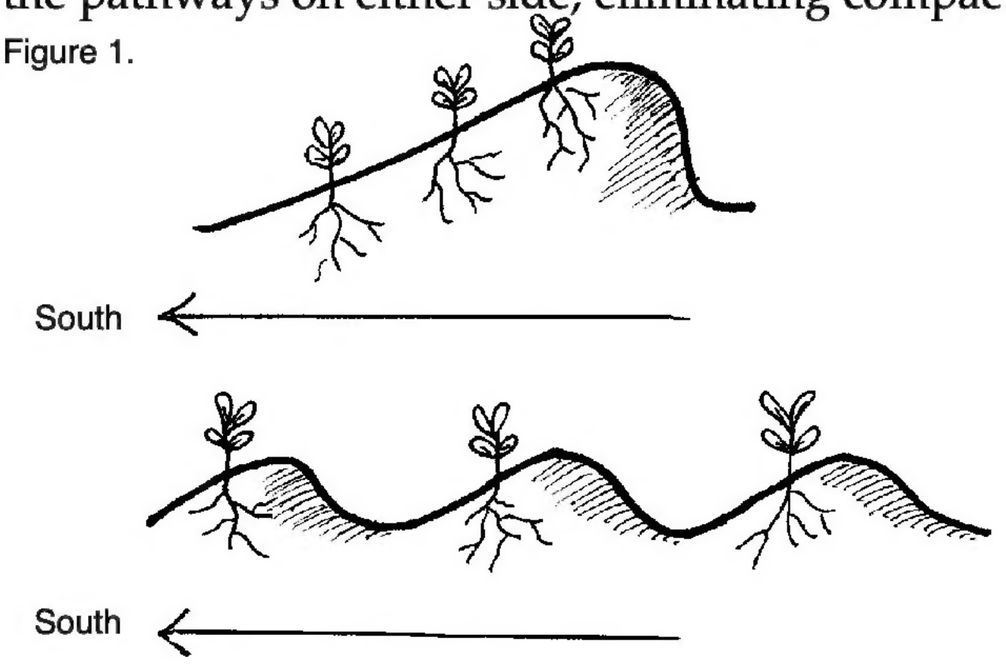
clay and compacted soil, and increase water retention and fertility in a gravelly, or sandy soil.

Tilling wet soil results in compaction and destruction of structure texture. In the spring, let your soil dry before tilling, or prepare your garden soils in the fall when conditions are dry. Organic matter, incorporated in the fall, such as compost, will be available for breakdown when spring temperatures rise. Fall soil preparation will allow the short season gardener to plant earlier in the spring.

Beds raised 10 to 12 inches above the normal soil level have many advantages in short season areas. Soil in raised beds dries out and warms faster in the spring, and drainage is better throughout the season, allowing for earlier planting and better plant growth. Soil in raised beds with a southern exposure will warm more than level soil (Figure 1). Add new soil, or amend native soil, during the formation of the beds. Make beds 3 to 4 feet wide so you can work from the pathways on either side, eliminating compac-

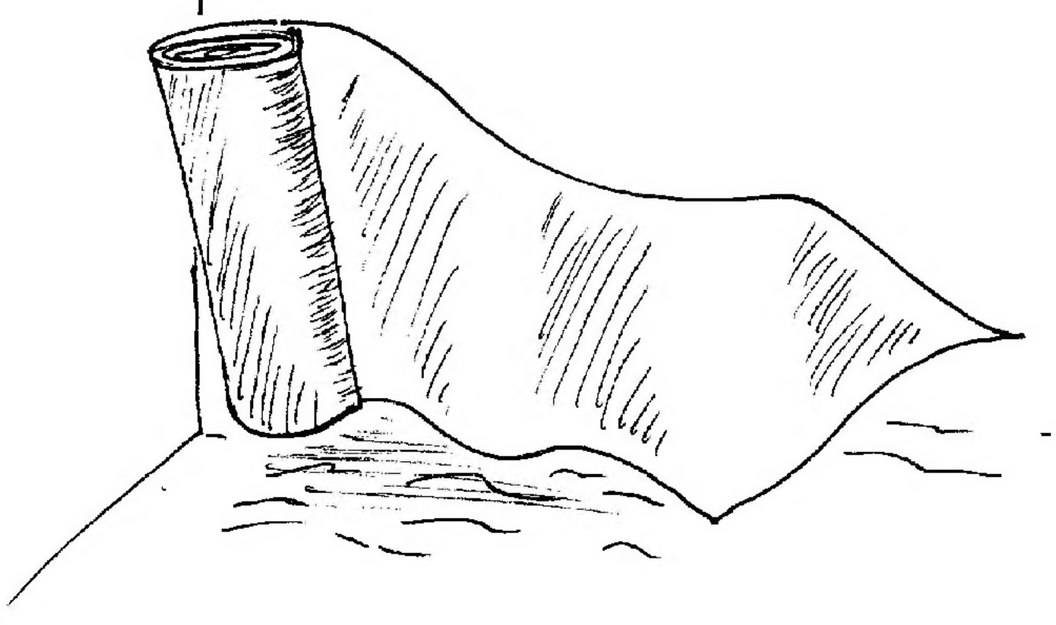
Figure 1.



tion from foot traffic. (See EC 1228, "Planning and Preparing Your Vegetable Garden Site," and NCFS 270, "Raised Bed Gardening.")

Warm the soil early.

To provide warm soil early in the spring, cover the bare ground with clear polyethylene plastic film. The plastic retains the sun's warmth and will often raise the soil temperature 10 to 15 degrees in a few days. A double layer of clear plastic, with a small, insulating airspace between the layers, will produce even higher soil temperatures.



Black plastic is not as effective as clear plastic in warming the soil and results in higher temperatures only when in contact with the soil.

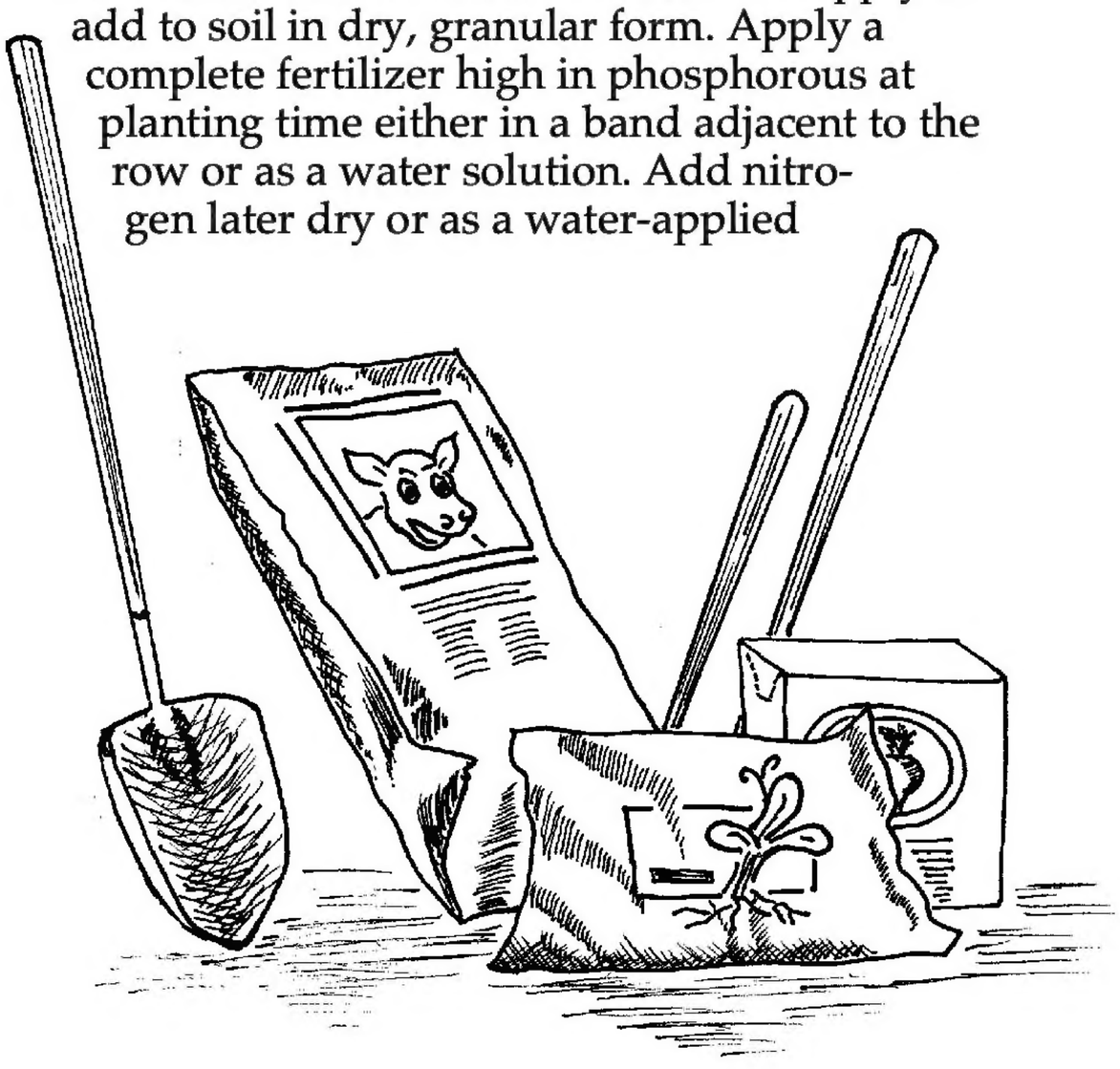
Wavelength selective plastic film, which allows heat waves to penetrate the film, but keeps light rays from entering, will also warm soil effectively in early spring. This type of material (marketed as infrared transmitting (IRT) plastic or under brand initials Al-Or) is used from early spring through the growing season. (See the section on permanent mulches for more details in working with plastic film mulch.)

Foster optimum fertility.

Vegetables planted in short season areas must have adequate supplies of plant nutrients (especially nitrogen) for optimal growth. Plants must get off to a fast start and sustain continued good growth to mature quickly. A soil test prior to planting is useful to determine the pH of your soil and what levels of nitrogen, phosphorous, and potassium are needed for best growth.

Organic fertilizers require warm soils to promote maximum release of nutrients. The warmer the soil, the faster the microbes can break down organic sources of nutrients to make them available over a period of time. In colder soils, these organic nutrients may be available too slowly. Supplemental soluble inorganic fertilizer may help promote the rapid growth needed.

Soluble fertilizers work well for plants in cold soils because the nutrients are immediately available. Dissolve these in water and apply or add to soil in dry, granular form. Apply a complete fertilizer high in phosphorous at planting time either in a band adjacent to the row or as a water solution. Add nitrogen later dry or as a water-applied



fertilizer. Several applications of nitrogen over the growing season, or fertilizing with a slow release material, will ensure a steady supply of nutrients. (See CIS 922, "Fertilizing Gardens;" FG 0050, "Fertilizer Guide: Vegetable and Flower Gardens, Except Irrigated Central Washington;" and FG 0052, "Fertilizer Guide: Home Vegetable Gardens, Irrigated Central Washington.")

Choose cool season adapted vegetables.

Cool season vegetables seeds can germinate in soil that is 40°F or cooler. They are also able to grow and mature when exposed to at cooler day and night temperatures. Most and can resist some frost and light freezes. Vegetables that will germinate at 40°F include: fava beans, beets, broccoli, brussels sprouts, Chinese cabbage, cabbage, carrots, cauliflower, kale, collards, kohlrabi, leeks, parsley, peas, radish, rutabaga, Swiss chard, celery, and turnips. Lettuce, onion, parsnip, and spinach will germinate at 35°F. Direct planting of these crops is possible in most growing areas. However, when the growing season is short (less than 90 days) and cold soils persist, season-extending cultural techniques may be necessary to mature even these crops. Techniques include soil warming, growing or purchasing transplants, pre-germination of seeds, plastic mulches, and plant covers.

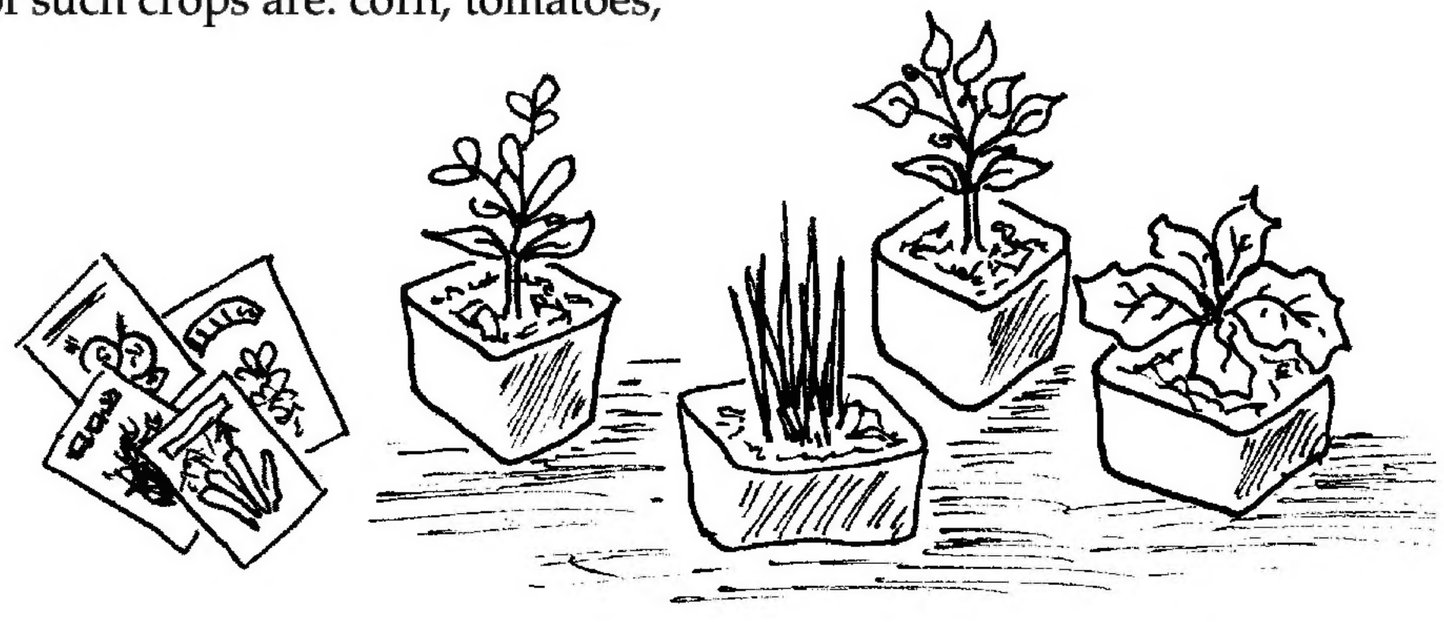
Of the cool season crops, beets, carrots, and onions will grow well in warmer temperatures, but the others will form seed stalks or produce lower yields with inferior flavor when planted during warmer temperatures. Crops like Chinese cabbage and celery may also produce seed stalks if exposed to cool spring temperatures unless varieties resistant to flowering and seeding are used.

Crops requiring 50°F or higher soil temperatures for seed germination will need to be started indoors and transplanted after the soil and air temperatures warm, or directly sowed at that time. Examples of such crops are: corn, tomatoes, green beans, dry beans, cucumbers, squash, pumpkin, eggplant, melons, cantaloupe, okra, and peppers. Season-extending cultural techniques will be necessary to realize a harvest of some of these crops in areas where the growing season is less than about 120 days. These warm season crops will need protection because they will not withstand any frosts, and cold nights will slow their growth. (See PNW 170, "Propagating Plants from Seed.")

Choose early maturing vegetables and cultivars.

The use of early maturing crops is another important factor for short season vegetable gardeners. Cool season crops such as spinach, radishes, lettuce, and kohlrabi are generally able to reach a stage where they can be harvested in less than 60 days. Of those requiring 60 to 90 days, peas, broccoli, beets, carrots, onions, cabbage, and cauliflower can all be planted during fairly cool weather. With corn and bush beans, however, the short season gardener will need to use season-extending cultural techniques. These techniques will become essential with crops requiring more than 90 days for maturity such as most tomatoes, peppers, eggplant, melons, squashes, and pumpkins. Not only do these crops require a greater length of time to reach an acceptable harvest stage, but they also must have warmer temperatures to grow.

Within each crop type, choice of cultivar is critical for the short season gardener. Choose early cultivars with the shortest days from planting to maturity. Even a few days can mean the difference between a harvestable crop or no crop at all. For example, corn cultivars vary from 53 to 112 days in the number of days to harvest. Choose cultivars for "northern gardens" or "cold climates." These grow and produce quickly. Look for number of days to maturity on the seed packet or in the catalog. (See PNW 45, "Choosing and Using Western Vegetables.")



Buy your seeds from local garden centers or seed outlets. In short season areas, they will carry season-appropriate crops and cultivars. Be sure to read the length of growing season on each packet before purchase. Seed catalogs have a wide choice of cultivars, and companies in the northern states and Canada are likely to have cultivars that are specific for short growing season needs. Obtain sources from garden magazines, or from your nearest Cooperative Extension office.

Start plants inside to get a jump on the season.

To produce some warm season crops in short season areas start vegetable plants indoors and transplant them to the garden. You can purchase transplants or grow your own. Growing your own transplants allows you to choose among more cultivars, and you can provide healthy plants of the desired size for transplanting. Research show the older the transplant, the better they will resistance to cold weather. it will have. Younger plants will take abuse and poor growing conditions better, but are more susceptible to frost damage.

Harden transplants by gradual exposure to outdoor conditions for seven to ten days to slowly acclimate seedlings to the outdoors before transplanting. Gradually expose the plants to a cooler environment with more light and less water. You can harden warm season vegetables so they can better resist exposure to against full sun, wind-whipping, and dry soil, but not to frost. Transplant on a cloudy day or in the evening to lessen the shock. Do not set tall plants any deeper than necessary. To avoid placing the roots in cold soil, lay them in shallow trenches with leaves turned up above the soil. Peppers and tomatoes are particularly suited to this practice. (See CIS 800, "Growing Vegetable Seedlings for Transplanting.")

Soak or pre-germinate seeds.

Germination can be accelerated a few days by soaking seeds of squash and other cucurbits in water overnight and planting while still moist. This approach also avoids a cold sensitive stage in early seed germination. This method is not as helpful for seed such as beans and peas that swell and germinate rapidly.

There is an advantage from pre-germination of the seed of most vegetables. Do this by keeping seeds warm and damp in a wet paper or cloth towel. When the new growth is 1/4-inch long, plant the seeds without allowing them to dry. A delay in planting, because of bad weather, may cause seedlings to grow too big to handle. If there is a delay in planting, refrigerate the seedlings for a short time at a temperature above freezing. This method can save up to two weeks for slow germinating crops such as parsley and carrot.

Use a permanent mulch, after the soil has warmed.

Most mulches will conserve moisture, protect soil from erosion, and reduce weed growth. They can also moderate soil temperatures and affect the nitrogen level in the surface layers of the soil. Short season gardeners will want to choose a growing season mulch that maintains or increases soil temperatures, and does not reduce the nitrogen level in the soil.

Probably the best mulch is a clear plastic mulch, which, in the early spring, is the best soil warmer. Remove clear plastic mulch when you plant seed or transplants. Planting can also be accomplished through holes and slits in the plastic. If the plastic is left in place, weeds may grow under it. Black plastic mulch will prevent the growth of weeds, but does not warm the soil as much as clear plastic, especially if it is not in good contact with the soil. Clear mulch can be replaced with black plastic at the time of planting to get the benefits of both.

Wavelength selective plastic film, which allows heat waves to penetrate the soil, but keeps light rays from entering, will both warm the soil and keep weeds from growing. This type of mulch can be left in place all summer.

Plastic film mulches serve as barriers to fruit rot and soilborne diseases by providing a soil free surface for vegetables. They also reduce leaching from rainfall and keep mobile fertilizer nutrients from being lost from the root zone. If treated with care, some thicker plastics can be used for more than one growing season. Disposal of large amounts of plastic can be a problem. A drip irrigation system installed over or under plastic mulch provides a very efficient and low maintenance method for growing vegetables.

Organic mulches generally moderate soil temperature. Most, if present on cold soil, will keep the soil from warming as fast as bare soil, keeping soil cold longer into the spring. This is especially true of light colored mulches, which reflect the sun's rays. Short season gardeners should only apply dark colored mulches, such as compost, after the soil has warmed. An application of dark colored mulch to warm soil in the late summer will help maintain a warmer soil later into the fall.

Organic mulches decompose on the soil surface, adding valuable plant nutrients to the soil. This is especially true with materials high in nitrogen such as vetch clippings. Very woody mulches, such as sawdust, when incorporated into the soil, will use soil nitrogen during decomposition, reducing the levels available to vegetable plants. To avoid this problem, do not incorporate woody organic mulches until after harvest. Addition of extra nitrogen to the soil at that time will enhance breakdown. It may be best to compost these materials prior to using them as mulch.

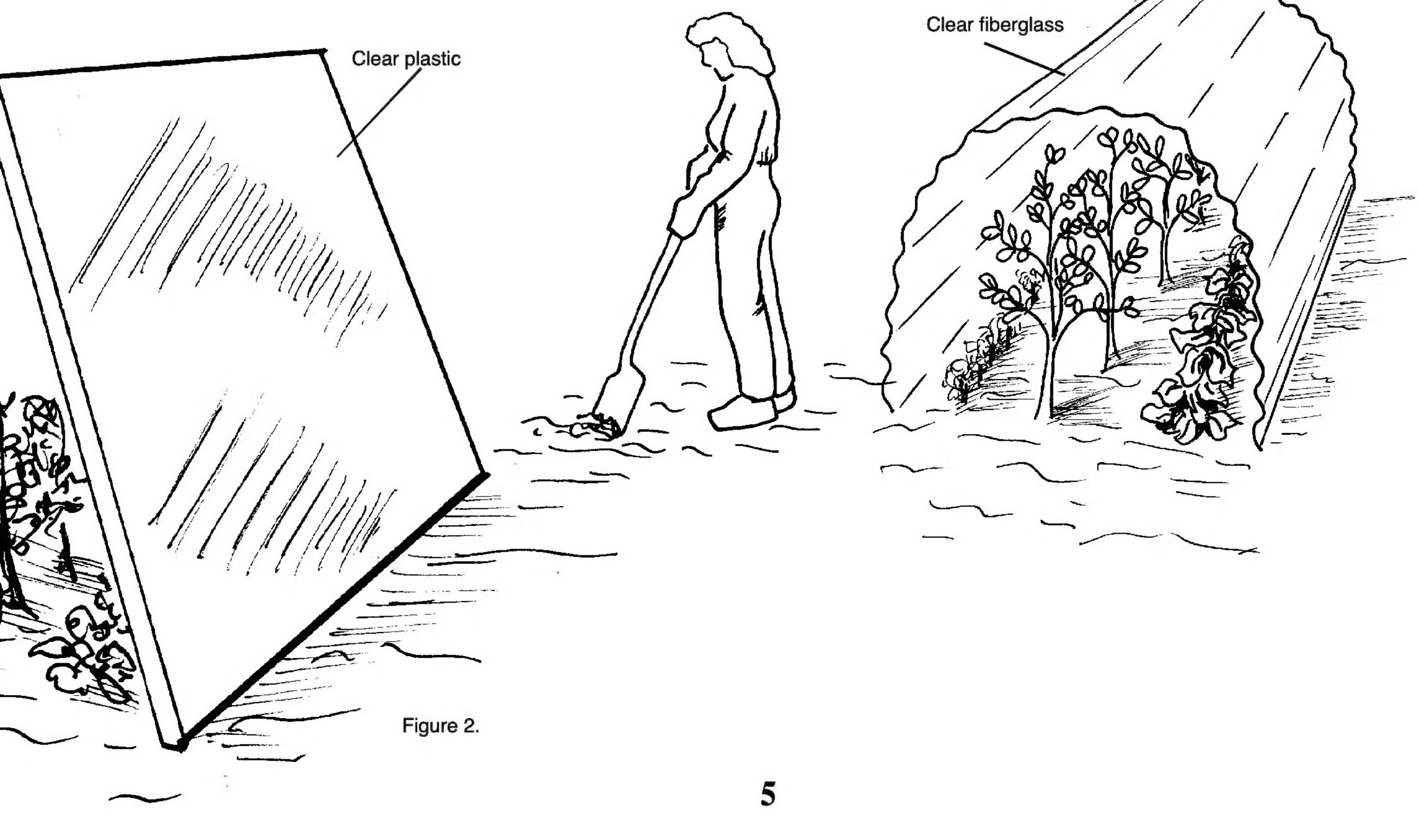


Figure 2.

One disadvantage of any type of mulch to a short season gardener is the reduction of nighttime heat radiated from warm soil into the surrounding air. This radiated heat, during spring or fall frosts, can be the difference between a frozen plant and one that is untouched by the cold. Placing a cover over a plant on a thickly mulched area may not afford much extra frost protection. (See CIS 837, "Mulches for the Home Landscape and Garden," and EC 1247, "Gardening with Composts, Mulches, and Row Covers.")

Use covers or screens to protect plants.

Covering plants modifies the temperature, wind, and humidity. Air and soil temperatures are warmer and the cover will conserve heat radiated from the soil during the night. A small increase in temperature has a large effect, because many plant growth reactions double their rate for every 18˚F. In short season areas, covering plants in the spring and the fall extends the warm season. Keeping covers in place during the whole season may be necessary in particularly cool areas.

Some protectors are large enough to cover several plants or rows of plants, similar to having a greenhouses with no foundation over tender garden crops (Figure 2). Cold frames have hinged covers that can be removed or propped open during the day. A light frame covered with plastic in an "A" shape (Figure 2) can be placed over one or several rows and left in place the whole growing season. Plant tall crops in the middle and low ones near the sides. A sheet of fiberglass arched over a row makes a tunnel leaving the ends open for ventilation (Figure 2). Clear plastic stretched over hoops provides the same effect. Floating row covers of spun polyester material can also be used to cover vegetables. The light material rests directly on the plants. These materials also will reduce insect damage by excluding the pests.

Small protectors, such as hotcaps of partially transparent waxed paper, can be used for one or two plants (Figure 3). Empty plastic gallon jugs with the bottoms removed can be placed over small plants. Clear plastic fences or screens placed around one or several plants give the same effect, but the open top will need to be covered on cold nights. Small plant covers (cloches) made of panes of glass or plastic held by a wire clamp have been used for many years in England. Old tires can provide wind protection for single plants planted inside and will absorb the sun's warmth. When filled with water, the water will hold heat for release during the night (Figure 3). Commercial plant covers with vertical tubes of water that store heat for release at night are ideal for individual plants.

Any covering method excludes bees, so uncover plants periodically for pollination. All covering systems need to provide ventilation to prevent overheating during warm days. A single layer of plastic or glass is a poor insulating material, so cover with blankets, sheets, canvas, or burlap

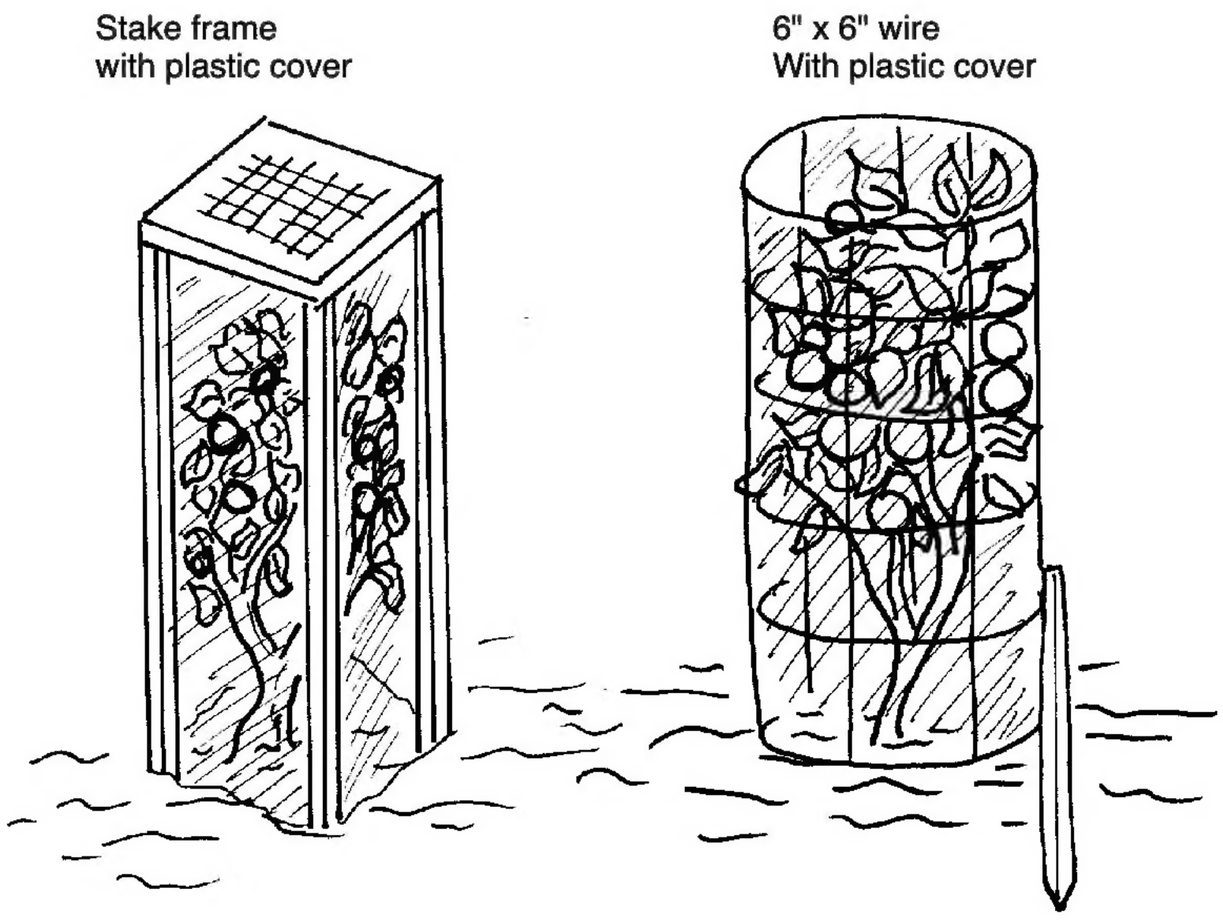
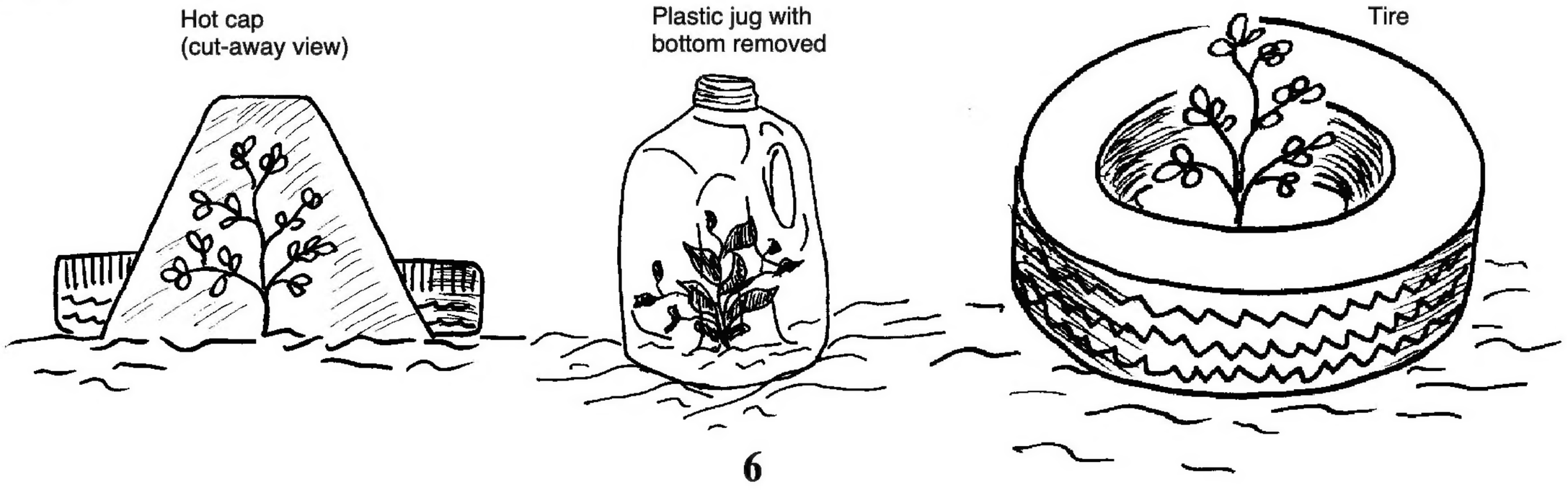


Figure 3.



sacks filled with straw to insulate the structures on cold nights.

Only the imagination and ingenuity of the gardener limit types and varieties of covering methods. For example, clear plastic stretched over the top of vegetables planted in a furrow will trap the sun's heat in the air and soil of the trench to speed the early growth (Figure 4). Later, slit the plastic over the row to prevent overheating. You may need to pull the leaves of the plants up through the slit.

Add heat to any of the above covering systems by burying heat tape in the soil, extending the growing season even longer. Planting vegetables into soil covering decomposing compost or manure piles and using any of the plant covers discussed will also provide extra heat for growth.

Water stores the sun's heat well. A simple technique is to half bury a gallon jug of water near each plant. During sunny days, water will warm and release the heat to the soil and the air near the plant during cool nights (Figure 5). Water-filled plastic bags, metal cans, or containers can be used in the same way. Heavy solid materials such as bricks, concrete blocks, and rocks will also absorb the sun's heat and release it later.

Figure 4.

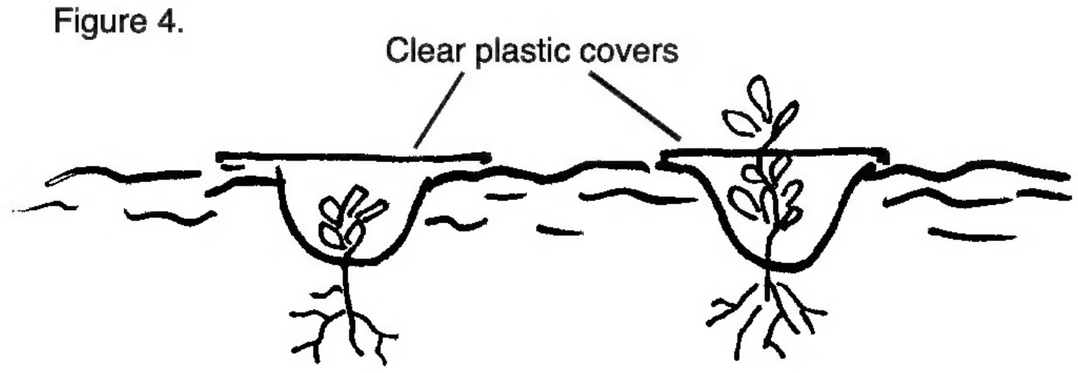
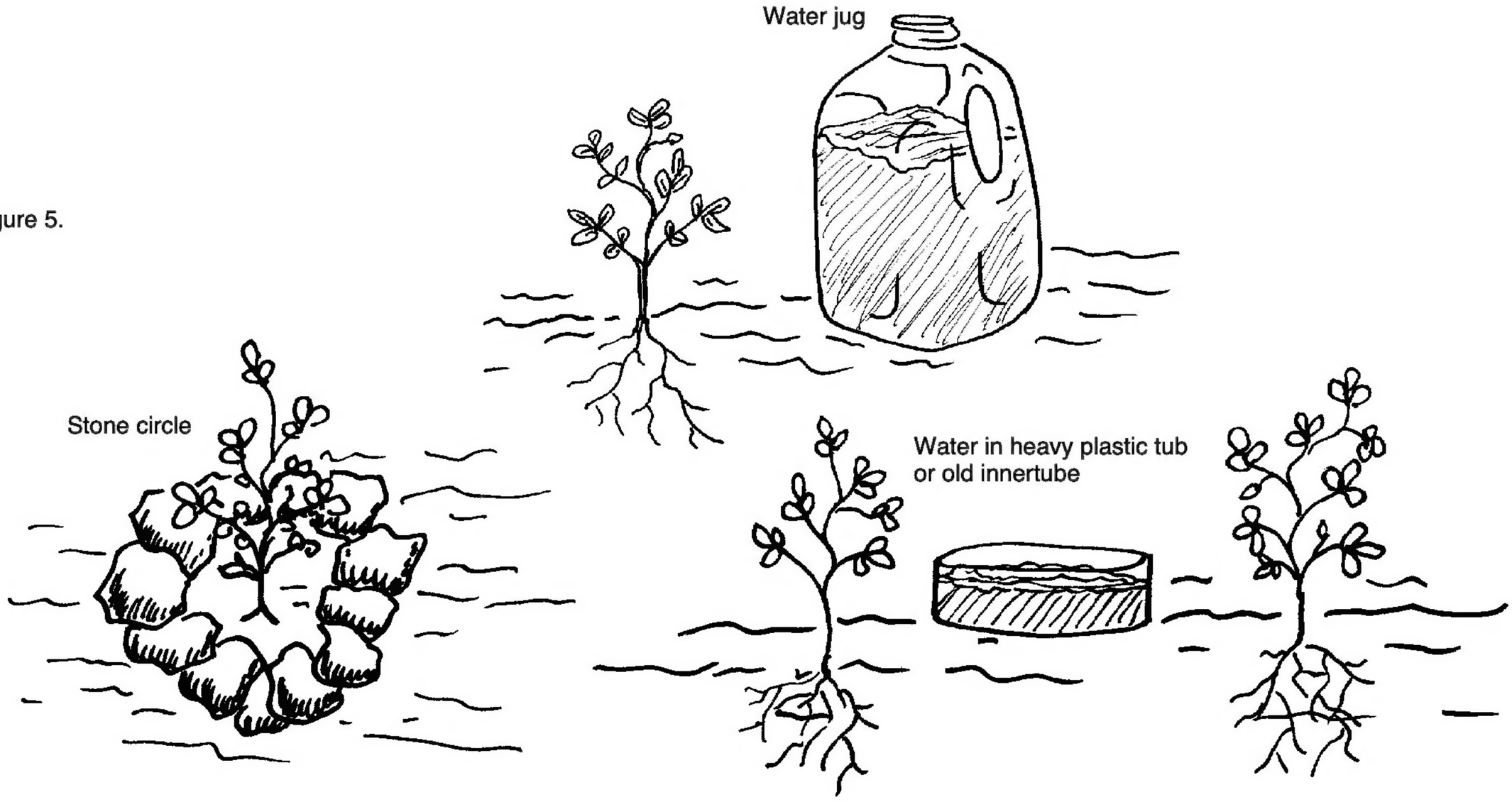


Figure 5.



Include a storing device inside plant covers to store solar heat for release during the night. Black containers and materials will absorb more heat than light-colored ones.

Windscreens and light reflectors used individually or in combination are useful to keep wind away from plants and to concentrate the sun's light and heat. An effective combination is a vertical screen along each row on the side toward the prevailing wind. If this is on the north side of the row, cover the screen with reflective material such as aluminum foil to reflect the sun's rays toward the crop. Shingles or boards set in the ground near small, newly transplanted plants will provide wind and sun protection. (See NCFS 246, "Constructing Cold Frames and Hotbeds.")

The techniques outlined in this publication can help the gardener meet the short season challenge and grow a variety of healthy homegrown vegetables. Accept the limitations of the climate, choose crops and varieties carefully, and select the season-extending practices that fit your lifestyle.

About the authors

JoAnn Robbins is an Extension Educator and Horticulturist at UI's Blaine County Extension Office. Wm. Michael Colt, is Extension Horticulturist at UI's Parma R&E Center.

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